Natural Resource Summary for San Antonio Missions National Historical Park

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Introduction

The San Antonio Missions National Historical Park (SAMNHP) is an 819-acre park that consists of several non-contiguous units along the San Antonio River. The park was founded in 1978 and originally consisted of several missions in San Antonio (Missions). Rancho de las Cabras was transferred from the State of Texas in 1995. Where possible, the data for the park is separated into two categories; Missions and Rancho de las Cabras.

Until recently, inventories for plants and animals on the park have been nonexistent or outdated. Many times these inventories were supplemented with data from casual observation. More recently, surveys for most taxa have been conducted and some are scheduled to be conducted in the upcoming years.

There is a partial listing of reference books on ecology or biology found in the library at the University of Texas at San Antonio pertaining to SAMNHP (University of Texas at San Antonio).

Vegetation

Introduction

Two inventories have occurred at SAMNHP. The first was conducted during 1981 by Van Auken on what is now about ½ the current park size and just included the Missions area (Van Auken 1981). The second inventory was completed in 2002 on both the Missions area and Rancho de las Cabras (Gallyoun et al. 2003). All macrohabitats were sampled including the grounds of the mission and all undeveloped areas beyond the mission grounds. A collection of herbarium specimens as well as slides was created during the second survey of documented species found on both sites within SAMNHP.

Missions

The Missions habitat was formally a major riparian forest community (Van Auken 1983). The park is composed of vegetation communities from both Blackland Prairie and South Texas Plains. Van Auken conducted a botanical survey during the spring of 1981 and found 290 taxa from 78 families (Van Auken 1981). He found seven habitat types within the park including urban land, farmland, grassland, acacia woodland, acequia woodland, marshland and riparian forest but focused his efforts on the latter five habitats. All habitats had been disturbed by humans and were in some stage of secondary succession. This inventory was not considered complete because early spring, late summer and fall blooming species had not been sampled. They found no endangered or threatened species on the survey although they found five species that were taxonomically similar to endangered species.

Van Auken and Bush (1984) described the changes in plant communities that have occurred in South Texas since it was settled by the Europeans. Prior to settlement, the landscape was largely grassland, with small patches of brush. Mesquite (*Prossopis glandulosa*) was limited to creeks and streams. A combination of a reduction in fire and an increase in grazing allowed for the

replacement of large grasslands with extensive brushlands. Van Auken and Bush (1984) and Bush and Van Auken (1987) studied successional changes in fire suppressed plant communities near Mission San Juan. They found that abandoned farms (row crop or grazed) remained in an open grassland for a short period before huisache (*Acadia smallii*) began to grow into a huisache savanna. Texas sugarberry (*Celtis laevagta*) grew slowly in its understory until it reached about 25 years then it quickly overtook the canopy and shaded out the huisache. They found that the Texas sugarberry could not establish in grasslands due to the nitrogen deficiencies caused by farming. Huisache, however, grew fine without added nitrogen and was in fact a nitrogen fixer, which allowed it to become established and gain a competitive edge over the grasses. The addition of nitrogen back to the soil allowed Texas sugarberry to become established and eventually overtake the huisache. Lohstroh and Van Auken (1987), Van Auken and Lohstroh (1990), Van Auken and Bush (1991), and Bush and Van Auken (1986b; 1995) performed additional field experiments to test mechanisms behind these findings. They found evidence that huisache achieved maximum growth in full sunlight and the exclusion of huisache is in fact due to its inability to grow in low light conditions instead of due to competition between the two species for soil resources. During greenhouse experiments, Burmeister and Van Auken (1989) found maximum root growth for huisache occurred at the highest light intensity tested and suggested the shade conditions existing beneath adult trees likely excluded seedlings from this habitat. Cohn et al. (1989) found that at low soil nutrient levels Bermuda grass (*Cynodon dactylon*) did not have a negative effect on establishment or growth of huisache. However, in more fertile soils vegetation gaps may be necessary for huisache to become established. Additionally, low light had little effect on Texas sugarberry growth and instead was negatively affected by plant competition, so that its growth would be promoted by vegetation gaps such as those caused by grazing. In additional greenhouse studies they found that the growth of both huisache and Texas sugarberry was inhibited by the four grasses tested (Van Auken & Bush 1990).

Van Auken and Bush (Van Auken & Bush 1985) also examined the succession that occurred along the flood plain terraces of the San Antonio River. They found that the recolonization of woody vegetation began within five years after a disturbance and composition changed drastically as colonizers gave way to dominant species of the mature community.

Fearing (1984) examined the use of native and exotic species by the early inhabitants of the San Antonio Missions. He found that the plants used were likely a mix of native species introduced to them by the Native Americans, plants from Spanish origin, and those brought by the Spanish from Central and South America. Many of these species are still found on the mission sites.

A 1985 survey of the plant species of the San Juan Woods, an 8-hectare forested area, found that chinaberry (*Melia Azedarach*), an introduced naturalized species, ranked third in absolute density and second in relative frequency of mature tree species. It has been found on all of the four mission sites as well as Espada and Acequia parks (San Antonio Missions National Historical Park 1986). It was found to successfully compete with native species such as Texas sugarberry or box elder (*Acer negundo*) and have a higher mean growth rate than sugarberry, huisache, or pecan (*Carya illinoiensis*). This has created a concern that without control it will likely outcompete the native plant species. As a wildlife food source, chinaberry is less utilized than the natives it would extirpate.

The interim management report discusses the need for research on the historical landscape of the Mission to develop guidelines concerning which plants (native and exotic) to plant at the mission (Cisneros 1986). Amdor (1989) discussed the importance of historical landscaping as it applies to Mission Concepcion, and recommended establishing a revegetation program with the use of native plants.

The 2001 Resource Management Plan (RMP 2001) listed Threatened and Endangered species, Species of Concern (SOC), and Rare species that could possibly occur within the park due to range and habitat types (San Antonio Missions National Historical Park 2001). Two plants listed as federal SOC, big red sage (*Salvia penstemoniodes*) and Correll's false dragon-head (*Physostegia correllii*), have been detected or are possible inhabitants of the Missions. One Rare state listed species, the South Texas rushpea (*Caesalpinia phyllanthoides*), may also be found within the park.

Gallyoun et al. (2003) conducted a vascular plant inventory during 2001 and 2002 and created an annotated list including 546 species of plants compiled from Van Auken (1981) and the current study. The final report for this study reported a total of 487 plant taxa that were collected during this period, of which 320 are native to the area (Carr 2003a). The rest are either naturalized or garden species. Sixty-three species detected on the Van Auken study were not found during this survey. Many of these species were garden or landscape species that could have been removed or died during the 20 years between surveys (Carr 2003a; Gallyoun et al. 2003). Carr found none of the federal SOC or state listed Rare species that the RMP 2001 stated as possible inhabitants and does not expect any threatened or endangered species will be found on future inventories. Two of the species documented on the Missions during this last survey are endemic to Texas.

Rancho de las Cabras

Rancho de las Cabras lies within the Tamaulipan Biotic Province region in South Texas (Cargill et al. 1998). In a survey of archeological sites at Rancho de las Cabras, Cargill et al. noted a number of prevalent floral communities in the area that have existed since the Holocene, including acacia, oak, ash, juniper, and spiny hackberry. Also noted was mesquite chaparral, which was the product human induced environmental exploitations. Mesquite and thorny brush occupied the upland areas, which had not been cleared for pasture.

Torres (1998) described two plant associations on the site: Upland South Texas Brush (in the upland area) and Riparian (river terraces and stream corridors). The associated habitat map provided greater detail and delineated six vegetation types including Upper and Lower Riparian, Improved Pasture, Recently Disturbed Imported Vegetation, Recently Disturbed Quarry, and Upland South Texas Brush which was further separated based on succession.

Van Auken and Bush (1988) examined seedling establishment, growth, and development of black willow (*Salix nigra*) and cottonwood (*Populus deltoides*) trees in riparian forests along the San Antonio River just south of Floresville. They found that smaller trees occurred at the river's

edge and tree diameter increased as distance from water increased until it peaked 5-10 meters from the water's edge, which is likely due to the deposition of sediment at the water's edge which slowly moves the river edge away from the growing trees. Once the trees get 20-30 meters from the water's edge they begin to die and are replaced by other species because black willow and cottonwood are only capable of establishing in river-edge canopy openings or light-gaps.

Carr (2003b) found a total of 358 plant species at the Rancho de las Cabras site. Seven of these species are endemic to Texas and are of conservation interest: crown coreopsis (*Coreopsis nuecensis*), Brazo rock-cress (*Arabis petioloaris*), Tharp's ponyfoot (*Dichondra recurvata*), Texas almond (*Prunus minutiflora*), Texas hiddenflower (*Cryptantha texana*), Greenman's bluet (*Houstonia parviflora*) and low spurge (*Euphorbia peplidion*). Although none are federally listed as Threatened or Endangered or SOC, three are currently listed as globally vulnerable to extirpation (G3) by NatureServe. Despite the inclusion of these species, no conservation recommendations were made due to the limited scope of the populations and the compromised habitat in which they were found. According to the RMP 2001, red sage a federal SOC, could also be found at this site but was not detected during this latest survey (San Antonio Missions National Historical Park 2001). Over 50 percent of the species detected on this survey were the first report for the county due to the limited studies conducted in the area.

Experts: M. Gallyoun, J.K. Bush, O.W. Van Auken, W. Carr

Animals

Introduction

Cargill et al. (1998) listed species common to the Tamaulipan Biotic Providence region that could exist at Rancho de las Cabras, including 61 mammals, 36 snakes, 19 lizards, and a variety of frogs and turtles.

Mammals

Cargill et al. (1998) listed 61 mammal species common to the Tamaulipan Biotic Province region, which could exist at Rancho de las Cabras. Archeological investigations of vertebrates from this region found evidence of opossum (*Didelphis* spp), pronghorn (*Antilocapra americana*), bison (*Bison* spp.), white-tailed deer (*Odocoileus virginianus*), peccary (family Tayassuidae), bobcat (*Lynx rufus*), jack rabbit (*Lepus* spp.) and cottontail rabbit (*Sylvilagus floridanus*) existed prior to European settlement.

The RMP 2001 contained a list of twelve common species previously detected on the park or whose range would encompass the park (San Antonio Missions National Historical Park 2001). Earlier attempts to live trap mammals on the park were ineffective and succeeded only in attracting fire ants (San Antonio Missions National Historical Park 1986). A list of species likely

to inhabit the park based on range maps was compiled from Davis (1966). NPSpecies contains a list of 33 species for the park.

The RMP 2001 listed Threatened and Endangered Species, SOC, and Rare species that could possibly occur within the park due to range and habitat types. Two federally endangered mammal species, jaguarundi (*Felis yaguarondi*) and ocelot (*Felis pardalis*), reach their northern most range in Wilson County so could be possible inhabitants or visitors at Rancho de las Cabras but unlikely at the Missions. In addition to these species, two species that have been state classified as Rare Species, cave myotis bat (*Myotis velifer*) and plains spotted skunk (*Spilogale putorius interrupta*), may also be found with in both sections of the park.

Ribble et al. (2003) conducted the first survey of the mammals (except bats) on the Missions and Rancho de las Cabras using a variety of techniques including trapping, track-plates, Trailmaster cameras and observation of signs. They documented 25 species of mammals on SAMNHP none of which were threatened or endangered species. The Missions and Rancho de las Cabras varied in the abundance of various species captured.

Bat Conservation International conducted the first bat survey for both the Missions and Rancho de las Cabras during 2002 and 2003. They examined the literature for possible species and found seven possible species. Mist-nets and harp traps, acoustic surveys, and roost surveys were used to detect five of these seven possible species at the sites. There were no permanent roost sites found at the mission buildings. Mission San Juan was indicated to be an area with high bat activity and is recommended as a site for future studies.

Experts: D. Ribble, M. Goodman (TPWD/BCI), and J. Kennedy (BCI)

Reptiles

The RMP 2001 contains a list of ten common species which have been detected or whose range would encompass the park (San Antonio Missions National Historical Park 2001). A list of species by an unknown author (listed in the NPSpecies database) compiled from 1983 and 1986 found 21 species on the park although 6 were listed as unconfirmed. During 2002 and 2003 the Texas Nature Conservancy conducted the first inventory of reptiles and amphibians within the park (Duran 2004). Multiple traps (minnow and hoop traps, two types of drift fence arrangements and pitfall traps), surveys (visual, auditory and road), as well as coverboards were used to sample the amphibian and reptile populations at both the Missions and Rancho de las Cabras. Twenty-seven reptile species, including six species of both turtles and lizards, and 15 species of snakes were confirmed at SANMNP during this inventory. An additional five species were previously observed on the park grounds. In addition to those species that were documented through sampling, Duran also lists possible species which could occur in the area based on ranges and documented sightings and comments on the probability they exist within the park.

The RMP 2001 listed Threatened and Endangered species, SOC, and Rare species that could possibly occur within the park due to range and habitat types (San Antonio Missions National Historical Park 2001). Two reptiles that have been listed as federal SOC, the Texas horned lizard (*Phrynosoma cornutum*) and Texas garter snake (*Thamnophis sirtalis annectans*), are possible inhabitants or visitors of the Missions. The Texas horned lizard has been seen on Rancho de las Cabras. In addition to these species, three state Threatened species (indigo snake [(*Dymarchon corais*], Texas tortoise [*Gopherus berlandieri*], and timber/canebrake rattlesnake [*Crotalus horridus*]) and two state listed Rare species (keeled earless lizard [*Holbrookia propinqua*] and spot-tailed earless lizard [*Holbrookia lacerata*]) may be found at the Missions. The indigo snake has been spotted at Rancho de las Cabras and the Texas tortoise, keeled earless and spot-tailed earless lizards are possible inhabitants. During the latest inventory, one State Threatened species, Texas tortoise, was observed at Rancho de las Cabras (Duran 2004).

Experts: C. Duran

Amphibians

Information on amphibians in the park is extremely limited. The RMP 2001 complied a list of common species that may occur in the park (San Antonio Missions National Historical Park 2001), but only one survey has been conducted in the park. Duran conducted the first survey for amphibians at the Missions and Rancho de las Cabras during 2002 and 2003. In the draft report, he documented six species of amphibians within the park. Additional anurans may be detected in future studies if surveys can be conducted during periods of increased rainfall. No salamanders or newts were documented during the sampling likely due to the dry weather that occurred when possible habitat was investigated. Duran also discussed which amphibian species, based on ranges and documented sightings, could occur in the area and commented on the probability they exist within the park.

Two salamander species were included on the RMP 2001 state list of Threatened and Endangered, SOC, and Rare species (San Antonio Missions National Historical Park 2001). The Threatened black spotted newt (*Notophthalmus meridionalis*) and Rare Edwards Plateau spring salamander (*Eurycea sp*.) may be found within the Missions. No threatened or endangered species were found on either site during the 2002-2003 survey.

Experts: C. Duran

Birds

Bird populations at SAMNHP have not been well studied. Two studies have been conducted in the park, the first of which did not cover the entire acreage that currently is included in the park. This first documented bird inventory was conducted during 1985 and 1986 by one of the park's rangers. This study documented at least 127 bird species observed in semi-natural areas in the

park; San Juan Woods, a riparian woodland, and Espada Labores agricultural fields (Coonan 1987). Coonan conducted bimonthly line transects and determined seasonal estimates of overall bird density, individual species abundance, and bird community diversity for each of the areas. This survey took place on what is now about one half the park. Greater densities were detected in San Juan Woods but Espada Labores had a greater diversity. Fall and winter had the highest densities for both areas. Coonan made recommendations for the management of these two areas. During the fall of 2003 the San Antonio Audubon Society began the first surveys of a two years study to examine avian abundance and diversity in SAMNHP (Brierley 2003). Volunteers and staff will perform variable point counts at each site six times throughout the year on both the Mission and Rancho de las Cabras.

Although avian surveys used were outdated, the RMP 2001 listed Threatened and Endangered species, SOC, and Rare species that could possibly occur within the park due to range and habitat types (San Antonio Missions National Historical Park 2001). Eight federally listed bird species, two threatened (Bald Eagle [*Haliaeetus leucocephalus*] and Piping Plover [*Charadrius melodus*]), one Proposed Threatened (Mountain Plover [*Charadrius montanus*]), and five SOC (Ferruginous Hawk [*Buteo regalis*], Loggerhead Shrike [*Lanius ludovicianus*], Mexican Hooded Oriole [*Icterus cucullatus cucullatus*], Reddish Egret [*Egretta rufescens*], and White-faced Ibis [*Plegadis chihi*]) have been detected or are possible inhabitants or visitors of the Missions. In addition to these species, five state listed species, one Endangered (American Peregrine Falcon [*Falco peregrinus anatum*]), two Threatened (Arctic Peregrine Falcon [*Falco peregrinus tundrius*] and Wood Stork [*Mycteria americana*]) and two Rare Species (Henslow's Sparrow [*Ammodramus henslowii*] and Zone-tailed Hawk [*Buteo albonotatus*]) may also be found with in the Missions and Rancho de las Cabras. Since this publication, the Zone-tailed Hawk state status has been increased to Threatened and the Mountain Plover is no longer on the federally Proposed Threatened list.

Experts: Mike Scully (Audubon), Ernest Roney (Audubon), Cliff Shackelford (Texas Parks & Wildlife)

Fish

Information on the fish populations within the park is limited. The 1986 Resource Management Plan (RMP 1986) describes fish sampling that occurred during the draining of the Espada Aqueduct but does not summarize species detected (San Antonio Missions National Historical Park 1986). A list of seven common species detected in the San Antonio River or the surrounding area is contained in the RMP 2001 (San Antonio Missions National Historical Park 2001). Eight voucher specimens caught within the park are stored at the Research Management Office. The RMP 2001 lists one fish species, Guadalupe bass (*Micropterus treculli*), as a state listed Rare Species that may be found within the Missions due to its range and habitat types. Fish surveys have been conducted by the San Antonio River Authority (SARA) on waters near SAMNHP including the San Antonio River, but not in the park's smaller waterways (Gonzales 2002). Recent sampling by the SARA suggests a slight improvement in water quality and native fish counts (San Antonio Missions National Historical Park 2003b).

The first fish survey for SAMNHP began during FY 2003 by Dr. Mike Gonzales of SARA. He documented 71 species in a preliminary list of possible species existing in the park based on any previous sampling, museum records, vouchers, or available literature. Twenty-six of these species have been detected in or adjacent to the park during previous SARA sampling periods (Gonzales 2003). Sampling began in the fall of 2003 and will continue through summer of 2004 and will sample fish populations from any water courses within the park including San Antonio River, Six Mile Creek, No Name Creek, Espada Acequia, San Juan Acequia, and San Antonio River bypass channel. Water courses will be sampled two times each growing season (March through November but avoiding July and August) using a variety of methods including minnow, bag, and riffle seines as well as electro-fishing and dip-nets. A final report is expected during summer 2005. During the fall 2003 sampling, 17 species were collected, none of which are of management concern. All sampling stations received fair to poor Index of Biological Integrity (IBI) Scores.

SARA has sampled water quality and fish in the San Antonio River Basin since 1996. Summary reports and a database of the information collected can be found on the SARA website (San Antonio River Authority 2004).

Experts: Mike Gonzales (SARA, Environmental services manager)

Invertebrates

Very little is known about both the terrestrial and aquatic invertebrates within SAMNHP. No intensive surveys of invertebrates have been or are planned to be conducted at the park. Knowledge of invertebrates at the park is from casual observation. The RMP 2001 lists one federal SOC butterfly, maculated manfreda skipper (*Stallingsia maculosus*), as a possible inhabitant or visitor in the SAMNHP due to its range and habitat preference (San Antonio Missions National Historical Park 2001). No invertebrates that are currently listed as state species of concern are believed to use the park. The website list a few of the common species found on the park. The RMP 2001 also lists two exotic insect species, red imported fire ants (*Solenopsis invicta*) and Africanized honey bees (*Apis mellifera scutellata*), within the park.

The RMP 1986 describes a cursory sampling of stream biota with a Surber stream sampler but no summary data were provided (San Antonio Missions National Historical Park 1986). The RMP 1986 described the crayfish and freshwater clams found in park water.

Experts: Mike Quinn (Invertebrate Biologist with Texas Parks & Wildlife)

Physical properties

Geology

Missions

Maxwell (1970) described the geology of multiple parks in Texas including SAMNHP. The Missions exist on the upper edge of the Gulf Coastal Plain, just south of the Edwards Plateau. The two physiographic regions are separated by the Balcones Escarpment, a series of subparallel faults, which allowed the Gulf Coast Plain to sink. The formations on the Coastal Plain as well as the Coastal Plain itself slope slightly to the southeast. These formations are relatively young and originate from the Cenozoic Era. It was formed as streams flowed into the sea and deposits occurred in shallow offshore water, in bars and deltas at the mouths of rivers, or in mud-flats along streams. These rocks are composed of layers of sandstone and clay. A layer of gravel was deposited on the northern edge of the Coastal Plain from ancient streams on the more northern Edwards Plateau. Step-like terraces have been formed by the San Antonio River. These terraces represent different ages at different levels. San Jose Mission is on a higher older terrace than the nearby Alamo and sits on bedrock of the Upper Cretaceous Navarro Formation. Sellards (1919) described this formation as primarily composed of clay and marl deposits although layers of lime rocks and limestone ledges are found in the upper limits. Several oyster fossils are common or abundant in this formation. Taylor et al. (1966) showed at least nine soil types in the Missions area of the park including Lewisville, Houston Black terrace, San Antonio, Webb, Trinity, Karnes, Patrick, Hilly gravelly Land and Frio.

Rancho de las Cabras

The Mineral Resource Survey of Wilson County places Rancho de las Cabras in the Claiborne group of the Gulf Coastal Plain on the Weches Formation (Cowan 1942). Cargill et al. (1998) developed a geomorphic map to display the maximum possible extent of the late Quaternary alluvial deposits. Through sampling, they found that late Quaternary alluvial deposits inset to the Pleistocene Leona Formation cover at least three-quarters of Las Cabras NPS.

At least four soil types, Aransas, Colibro Sandy Clay Loam, Saspamco Fine Sandy Loam, and Frio are found at Rancho de las Cabras according to the Soil Survey of Wilson County (Taylor 1977). According to the Cultural Landscape Inventory (Torres 1998), a portion of the southwest corner of the park was excavated to extract caliche, a chalklike limestone, for road construction. Sandstone outcroppings also occur on this site.

Experts: D. Cargill (Rancho de las Cabras), Maxwell, Taylor

Hydrology

Groundwater

Introduction

Groundwater is abundant throughout most of Bexar County with most drawn from the Edwards limestone along the Balcones fault zone. The Edwards Aquifer consists of three limestone

formations and is the main ground water source for the San Antonio area (San Antonio Missions National Historical Park 2001). Infiltration of rainwater and surface rivers help to recharge the aquifer but the bulk of the water comes from the underflow of streams on the Edwards Plateau. The surface water recharge zone is 15 to 20 miles northwest of the SAMNHP and is highly susceptible to contamination due to the highly porous materials within the zone. The Edwards Aquifer is layered between the Glen Rose Formation below and the Del Rio Formation above.

General water quality studies

A 10-year plan to continue monitoring and include topics for special study of the hydrology of the Edwards Aquifer was proposed in 1984 (Land 1984). The U.S. Geological Survey in conjunction with a number of local agencies has collected water quality data on the Edwards Aquifer over a multiyear period (Brown et al. 1991; Brown et al. 1992; Gonzalez 1976; Harmsen 1977, 1978; Nalley 1989; Nalley & Rettman 1988; Nalley & Thomas 1990; Ozuna et al. 1987; Ozuna et al. 1988; Perez 1981, 1982, 1983; Perez & Harmsen 1980; Reeves 1981; Reeves et al. 1982; Reeves et al. 1984; Reeves & Ozuna 1985, 1986). Summarized data exist for periods as far back as the 1930's. The measured parameters varied over the years according to specific information needs but included such measurements as dissolved oxygen, water temperature, pH, specific conductance, carbonate, bicarbonate, bacteria, biochemical oxygen demand, total organic carbon, nutrients, methylene blue active substances, major ions, pesticides and trace metal concentrates. The Edwards Aquifer website has summaries and online databases of flow, water levels, and general summaries for water quality as well as a bibliography of technical and general literature existing on the aquifer (Edwards Aquifer Authority 2004). The San Antonio River System also maintains a searchable database for historic and current water levels and flow measurements (San Antonio Water System 2004).

Recharge studies

Puente (1978) estimated the annual recharge of Edwards Aquifer for 1934 through 1975 based on a water-balance equation. The recharge was estimated as the difference between field measurements of stream flow above and below the recharge area plus seepage losses from multiple lakes. The average annual recharge for the aquifer during this period was 537 thousand acre-feet (range 43.7-1,711.2 thousand acre-feet).

To better understand the effects of urban development in the Edwards Aquifer recharge zone, the U.S. Geological Survey and San Antonio Water System developed a watershed model to simulate runoff and recharge as well as estimate constituent loads in the surface-water runoff (Ockerman 2002). They used rainfall and runoff collected during 1970-98 to calibrate and test the model which was then used to simulate runoff and recharge for 1997-2000. They found that the total Edwards Aquifer recharge for Bexar County was comprised of 37 percent streamflow, 56 percent rainfall, and 7 percent flooding impoundment during 1997-2000. The largest annual loads for suspended solids, dissolved solids, dissolved nitrite plus nitrate nitrogen, and total lead was from undeveloped land but varied directly with rainfall.

Contamination studies

Minkin et al. (1979) conducted a regional survey of uranium in groundwater samples of the San Antonio area. They found higher levels of uranium in areas paralleling the regional strike of the formations in the area. The levels were associated with a number of chemical parameters that varied according to the location.

Buszka (1987) analyzed water samples from 1976-85 to determine relationships between ground-water chemistry, hydrogeology, and landuse. He found most of the contamination occurred in the unconfined zone (the same zone in which the recharge area lies), which lies to north of the San Antonio area. Buszka et al. examined water samples from several wells in the recharge area for Edwards Aquifer as well as a major discharge area in the confined zone for volatile and semi-volatile organic compounds (Buszka et al. 1990). They found two compounds, Tetrachloroethene (PCE) and 2,6-bis-di-tert-butyl-p-benzoquinone (DTBB), which could indicate contamination due to human waste disposal.

Clark (2000) described a method to assess the vulnerability of ground water contamination associated with urban runoff in the recharge zone. A rating for each of five natural features was summed and used to create a map of the susceptibility to contamination within the recharge zone. It showed the highest contamination susceptibility in the recharge zone was in Bexar County.

Saltwater infiltration

One special study examined the hydrogeologic framework and geochemistry of the aquifer to determine if saltwater intrusion was likely. Groschen and Buszka (1997) found the saline-water zone was hydrologically compartmentalized, due in part to faults that impeded downward, and likely upward, flow of water so that an updip movement of saltwater toward freshwater was unlikely.

Miscellaneous studies

Mench et al. (1980) examined the freshwater diagenesis of the Cretaceous Edwards Limestone and found that second-stage calcites can be distinguished from the first-stage calcites both regionally and petrographically.

Palaniappan (1977) conducted an engineering investigation on the effects of moisture and ground water on the Mission San Jose foundation. Willard (1981) described the effects the soil and water have on the structures at the Missions. Water can easily travel through the highly porous sandy loam surface soil but is trapped by the underlying clayey subsoil. This trapped water is absorbed by the limestone walls of the buildings. The expansion and shrinking of the clayey subsoil, and in turn the walls of the building, in response to the moisture in the soil causes deterioration of the buildings. MacLay (1986) described the effect of the geologic structure of the area on the circulation of the ground water of the Edwards Aquifer.

Experts: John Hoyt (Edwards Aquifer Authority, Aquifer Science), Earl Parker II (Edwards Aquifer Authority, Investigation and Monitoring), Gregg Eckhardt (author of edwardsaquifer.net)

Surface water

Introduction

Natural surface water in the Missions consists of three segments of the San Antonio River in their natural pre-flood control state and Piedras Creek, a tributary of the San Antonio. Espada Acequia, a historic irrigation system, also flows through the park. A second acequia on the park, San Juan Acequia, has been without significant waterflow for more than 25 years. Waterflow is scheduled to be reintroduced during the summer of 2004 after a voluntary cleanup of soil contamination caused by a local mechanic shop (Pers. comm. G. Mitchell; San Antonio Missions National Historical Park 2003a, b). Surface water on Rancho de las Cabras exists in the San Antonio River, Picosa Creek, drainageways and arroyos, and quarry wet areas.

Water quality studies

The RMP 1986 listed the Howell Hydrocarbon refinery and the City of San Antonio's Rilling Roads sewage treatment plant, as well as other industries along the banks of the San Antonio, as possible point source pollution sites due to their upstream location and the discharge released into the River (San Antonio Missions National Historical Park 1986). The San Antonio River Authority collects and analyzes samples between Howell and San Juan Mission. Keelan (2002) described the 2002 water monitoring of the portion of the park, Espada Park, which is adjacent to the refinery. Groundwater was analyzed from samples from six wells and four piezometers. Non-aqueous phase liquids or phase-separated hydrocarbons were detected in two wells. The PSH and dissolved plumes were described as stable due to the lack of significant movement during the 1992-2002 monitoring period.

Kaiser et al. (1993) discussed the status of water quality monitoring in 10 national parks in Texas and also touched on the issues and concerns involving these parks.

The RMP 2001 discussed depressed O_2, high fecal coliform, chloride, sulfates, and nutrient concentrations found in park waters (San Antonio Missions National Historical Park 2001). The poor water quality is due in part to the treated municipal sewage and surface runoff that runs into the river. During low river flow the water is primarily treated municipal waste water that the river can not 'assimilate efficiently.' It also reports that monitoring data from the San Antonio River Authority have found high levels of pesticides and total suspended solids.

Currently the San Antonio water flows through Bexar and Wilson counties into the park boundaries and is listed on the State's Section 303 (d) as impaired. The Strategic Plan for SAMNHP sets forth a goal to improve water quality by 30 September 2005 (San Antonio Missions National Historical Park 2000). Basic water parameters and water chemistry are being examined as a part of a larger study conducted by SARA to examine the fish populations on SAMNHP. In the proposal for this study, Gonzales (Gonzales 2002) described the changes to the surface water courses that have occurred since the creation of the park, including the relocation of the city's wastewater effluent downstream from the park, upgrades to the

wastewater collection system, and reductions to point and non-point pollution. SARA has sampled water quality and fish in the San Antonio River Basin since 1996. Summary reports and a database of the information collected can be found on the SARA website (San Antonio River Authority 2004). Water quality data for surface water in the state, including the San Antonio area, have been monitored by TCEQ since 2000. Data on and summaries of the physical, chemical, and biological parameters of these water bodies are listed on their website (Texas Commission on Environmental Quality 2004b). In a discussion of the geologic history of the San Antonio River, Hammond describes the primary flow of the San Antonio as springs from the Edwards Aquifer instead of a drainage of the Edwards Plateau (Committee 1991). A detailed history of the anthropogenic changes that have occurred on the river is also outlined.

A baseline inventory of water quality of SAMNHP, which examined data from Environmental Protection Agency's (EPA) databases, found 29 groups of parameters that exceeded water quality screening limits at least one time (between 1955 and 1998) in the study area (Horizon Systems Corp. 1999). Although only one of the 285 monitoring stations was located within the park, the rest exist within the study area. This report described waters that are heavily impacted by anthropogenic activities such as development, stormwater runoff, agriculture, mining, recreation, wastewater discharge, atmospheric deposition and military operations.

Experts: M. Gonzales (San Antonio River Authority), B. Caldwell (Texas Commission on Environmental Quality Water Section Manager San Antonio)

Air Quality

There are limited data collected within the park on air quality. Thurber (1982) described results of an air quality monitoring study that was conducted on SAMNHP during 1981. Instead of collecting data within its boundaries, the park uses the Bexar County information in regards to air quality since the park itself is fragmented units with in San Antonio (San Antonio Missions National Historical Park 2001). The Texas Natural Resource Conservation Commission maintains a searchable database for historic and current air quality measurements for the state including stations in the San Antonio area (Texas Commission on Environmental Quality 2004a). Monitoring stations are operated by TCEQ, local government entities, or private monitoring networks.

The ozone depletion potential of San Antonio is considered to be a Class II as it relates to the Clean Air Act, which is less potential than a Class I (San Antonio Missions National Historical Park 2001).

Experts: R. Hite (Texas Commission on Environmental Quality Air Section Manager San Antonio), D. Birch (Alamo Area Council of Governments- air quality)

Ecosystem studies

Introduction

There is currently no good vegetation classification system within the park. Plans to develop a system based on dominant plants are scheduled to begin in FY05.

Forested Riparian Areas (intermittent streams and acequias)

Remnants of the old river channel have become riparian oases creating habitat for many wildlife species. The SAMNHP website describes how acequias, historic irrigation ditches used to grow mission crops in the 18th century, have developed riparian vegetation over time and provide valuable habitat for wildlife (San Antonio Missions National Historical Park 2003b).

The Missions' habitat was formally a major riparian forest community (Van Auken 1983). The park is composed of vegetation communities from both Blackland Prairie and South Texas Plains. Van Auken and Bush (Van Auken & Bush 1985) examined the succession that occurred along the flood plain terraces of the San Antonio River. They found that the recolonization of woody vegetation began within five years after a disturbance and composition changed drastically as colonizers gave way to dominant species of the mature community.

Bush and Van Auken (1986a) conducted soil analysis of ten river terrace plant communities (in the floodplain) and examined the soil development, chronosequences, and nitrogen fixers. They also conducted a study examining the vegetation distribution, density, species, community importance, and the response to certain environmental factors in the San Antonio River gallery forest, the only one of its kind left in the area. (Bush & Van Auken 1984). Van Auken (1983) studied the species make-up of the major plant communities and listed boxelder, elderberry (*Sambucus Canadensis*), chinaberry, and white mulberry (*Morus alba*) as important community tree species. Van Auken and Bush (1988) also examined factors affecting the growth and development of black willow and cottonwood communities along the San Antonio River. They found that the community was confined to a 20-30 meter band along the river since river-edge canopy openings were essential for seedling establishment and older trees begin to die as they reach this distance from the water.

Torres (1998) described two plant associations on Rancho de las Cabras: Upland South Texas Brush (in the upland area) and Riparian (river terraces and stream corridors). A habitat map provided greater detail and delineated two vegetation types within the Riparian association, Upper and Lower Riparian.

Old Agricultural Field

No ecosystem studies have focused on the old agricultural field.

Scrubland

Bush and Van Auken examined the changes in plant communities that occurred because of overgrazing or abandonment of farms coupled with a lack of historic fire (Van Auken & Bush 1984), which was an important element in maintaining grasslands. They found that overgrazing reduced the fuel for fires. As fire was restricted and over grazing created open patches, brush species were able to become established. Cattle do not generally feed on brush species. In the absence of fire, brush species could out complete grasses. Bush and Van Auken conducted multiple studies examining the succession of grassland to woodland communities and the environmental factors that influence these changes (e.g., Bush & Van Auken 1986b; Bush & Van Auken 1987; Bush & Van Auken 1995; Van Auken & Bush 1984; see the vegetation section for additional citations).

Management issues

Introduction

Because of the park's proximity to San Antonio, a city of over 1.5 million people, it is subject to many environmental problems, including air and water quality, disturbed lands, hydrologic disruption, exotic species, pests, and increased noise. Additionally, the balance between the management of the park for the cultural landscape and the biological integrity is a challenge for resource managers in this urban setting.

Exotic species

Vegetation

Results from a 1985 survey of plant species in the San Juan Woods found that chinaberry was one of the most populous tree and sapling species. Due to its quick growth rate there is concern that it could outcompete its native counterparts. There is also concern that three naturalized grass species, Bermudagrass, kings rand bluestem (*Bothriochloa ischaemum*), and johnsongrass may out compete many of the native species. The SAMNHP website lists four predominant exotics, chinaberry, glossy privet, giant reed (*Arundo donax*), and johnsongrass (San Antonio Missions National Historical Park 2003b). Also, bedstraw is a problem not currently being controlled.

The 2003 Annual report states that 100% or 240 ac of land disturbed by farming or other past land uses will be in a 'restoration in progress' status by 30 September 2005 (San Antonio Missions National Historical Park 2003a). It also describes efforts to remove two exotic invasive plants from 180 ac of the park. Chinaberry and wax-leaf privet (*Ligustrum lucidum*) are found in areas of the park previously disturbed by farming or urban sprawl. Removal areas will be monitored for regrowth and treated as needed. Replanting of native vegetation to these areas will occur as well. There also are plans to focus attention on exotic forbs and grasses, especially on the planned agricultural demonstration farm at Mission San Juan, provided funding can be acquired (San Antonio Missions National Historical Park 2001). Giant reed also is being

actively controlled. Beginning in the spring of 2004, the distribution of non-natives will be mapped throughout the park.

Animals

According to the park's website, three exotic insect species are considered pests, subterranean termite (*Coptotermes formosanus*), the Africanized honey-bee, and the fire ant. Subterranean termites can have a devastating effect on the cultural resources within the park and are currently being managed through bait stations. Current research from Texas A&M suggests the honey bee swarms in South Central Texas are hybrids of the European honey-bee and the Africanized honey-bee. Populations are being controlled through removal of nests. Fire ants are controlled by insecticides.

Exotic aquatic species such as the Asian clam (*Corbicula fluminea*) and blue tilapia (*Tilapia aurea*) also occur in the park (San Antonio Missions National Historical Park 2001).

The park's close proximity to San Antonio also has created problems with stray pets. Unchecked, this can lead to feral populations of cats and dogs, which have an unknown impact on native animal populations as well as provide a safety concern for visitors (San Antonio Missions National Historical Park 2003b).

Adjacent landuse impacts

The city of San Antonio is having an unknown effect on the air quality at SAMNHP. Corrosion of sandstone and limestone could be accelerated from acid rain deposition. There has been no baseline monitoring of acid rain, ozone emissions, or air particulates in the park and no details are known on the effects on the flora and fauna of the local watershed.

Encroachment by the neighboring city of San Antonio has destroyed viewsheds, caused the contamination of the river, increased noise pollution from the local airport, and threatened the natural and cultural resources within the park. Exotic species, as discussed above, have become a major problem in the park and threaten to displace native vegetation while clogging the acequias (San Antonio Missions National Historical Park 2001).

There have been several occurrences of environmental hazards caused by neighboring businesses or industries. A 1978 Environmental Impact Statement for the San Antonio wastewater treatment system discussed a strong hydrogen sulfide odor coming from the San Antonio River as it flowed close to Mission San Juan and the Espada Acequia (Environmental Protection Agency 1978). A dieback of canopy trees along the drainage of the Howell Hydrocarbons Refinery caused concern that hydrocarbons were leaking into the water and soils. A study of the local soils did not find elevated levels of hydrocarbons (Fenn 1985). A study on ground water at Howell Hydrocarbons found that seepage could be transported through an old utility trench into the San Antonio River (Walker et al. 1985). RMP 1984 discussed effects from surrounding landuses such as Howell Refinery, Rilling Road sewage treatment plant, upstream pollutants of

gaseous and liquid materials from industrial plants, encroachment and trespassing (Cisneros 1984). The RMP 2001 described a 1993 Trichloroethene plume (TCE) that was detected near the park and traced to the Brooks Air Force Base (San Antonio Missions National Historical Park 2001). Water runoff from Kelly Air Force Base, which is located upstream from SAMNHP, drains into Six-mile Creek which then feeds into the park's Espada acequia and aqueduct. There are concerns that this may pose a threat to the water quality on the park due to the potential biological toxicity of the waste water that could contaminate park water.

One onsite hazard was found in 1994 during a demolition of a structure on the San Juan Mission. The 1932 garage was found to be constructed from automobile battery casings in place of brick cinder blocks. Procedure for the cleanup was detailed in a site remediation report (TIWC Environmental Services 1994).

Finally, Kaiser et al. (1993) discussed the status of water quality monitoring in 10 national parks in Texas and also touched on the issues and concerns involving these parks.

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GIS DATA, DATA SETS

A list of available spatial and non-spatial data is provided for the park. Data have been organized into the following groups: GIS data, non-GIS digital maps, hardcopy maps, digital databases, digital publications, NatureBib maps and abbreviations. GIS data have been further separated into three categories: park specific or local, state-wide, and nation-wide. A unique identifier has been given to each line of data as follows: "X_#", where "X" is a letter describing the data type (L=local GIS, S=State-wide GIS, N=Nation-wide GIS, M=digital map, I=interactive map, D=database, and P=publication) and "#" is a unique number. Basic information is provided to allow quick review of the publicly available data, including the title of the data and the organization from which the data are available. To view more extensive details about the data, an EXCEL workbook has been provided. The EXCEL workbook includes several datasheets for each of the aforementioned data categories. Among some of the additional details provided in the EXCEL workbook are partial metadata, web addresses, and descriptions of the data. Blank fields within the EXCEL workbook represent information that were not readily available, but can be gathered at a later date with a more in-depth search of the available metadata.

Counties
Bexar
Wilson (Rancho de las Cabras)

Zip Code
78210

Spatial Extent (Including Rancho de las Cabras)

Lat	Long
29.39	-98.50
29.09	-98.16

Spatial Extent (Excluding Rancho de las Cabras)

Lat	Long
29.39	-98.50
29.30	-98.44

Quadrangles
San Antonio East
Southton
Dewees (Rancho de las Cabras)

River Basin
San Antonio

Watersheds	HUC	
Upper San Antonio	12100301	
Lower San Antonio	12100303	(Rancho de las Cabras)

Local: by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Area	Resolution
Missions								
L_1	TNRIS	USGS	San Antonio East NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_2	TNRIS	USGS	San Antonio East NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_3	TNRIS	USGS	San Antonio East SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_4	TNRIS	USGS	San Antonio East SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_5	TNRIS	USGS	San Antonio East NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_6	TNRIS	USGS	San Antonio East NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_7	TNRIS	USGS	San Antonio East SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_8	TNRIS	USGS	San Antonio East SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_9	TNRIS	USGS	San Antonio East NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_10	TNRIS	USGS	San Antonio East NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_11	TNRIS	USGS	San Antonio East SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_12	TNRIS	USGS	San Antonio East SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_13	TNRIS	USGS	San Antonio East NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_14	TNRIS	USGS	San Antonio East NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_15	TNRIS	USGS	San Antonio East SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_16	TNRIS	USGS	San Antonio East SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_17	TNRIS	USGS	San Antonio East	DRG	1:24,000	Vector	7.5 x 7.5 minute	
L_18	TNRIS	USGS	San Antonio East	DRG	1:100,000	Vector	7.5 x 7.5 minute	
L_19	TNRIS	USGS	San Antonio East	DRG	1:250,000	Vector	7.5 x 7.5 minute	
L_20	TNRIS	USGS	San Antonio East	Hypsography	1:24,000	Vector	7.5 x 7.5 minute	
L_21	TNRIS	USGS	San Antonio East	DEM	1:24,000	Raster	7.5 x 7.5 minute	30 m
L_22	TNRIS	USGS	Southton NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_23	TNRIS	USGS	Southton NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_24	TNRIS	USGS	Southton SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_25	TNRIS	USGS	Southton SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_26	TNRIS	USGS	Southton NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_27	TNRIS	USGS	Southton NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_28	TNRIS	USGS	Southton SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_29	TNRIS	USGS	Southton SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_30	TNRIS	USGS	Southton NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_31	TNRIS	USGS	Southton NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m

Local: by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Area	Resolution
L_32	TNRIS	USGS	Southton SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_33	TNRIS	USGS	Southton SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_34	TNRIS	USGS	Southton NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_35	TNRIS	USGS	Southton NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_36	TNRIS	USGS	Southton SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_37	TNRIS	USGS	Southton SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_38	TNRIS	USGS	Southton	DRG	1:24,000	Vector	7.5 x 7.5 minute	
L_39	TNRIS	USGS	Southton	DRG	1:100,000	Vector	7.5 x 7.5 minute	
L_40	TNRIS	USGS	Southton	DRG	1:250,000	Vector	7.5 x 7.5 minute	
L_41	TNRIS	USGS	Southton	Hypsography	1:24,000	Vector	7.5 x 7.5 minute	
L_42	TNRIS	USGS	Southton	DEM	1:24,000	Raster	7.5 x 7.5 minute	30 m
L_43	TNRIS	TWDB	San Antonio Degree Block (30N 29S 99W 98E)	Hillshade		Vector	1 x 1 degree block	
L_44	TNRIS		San Antonio Degree Block (30N 29S 99W 98E)	NED			1 x 1 degree block	
L_45	TNRIS		Bexar County	DOQ Mosaic	1:12,000	Raster	County	1 m
L_46	TNRIS	TxDOT	Bexar County	Transportation Urban		Vector	County	
L_47	TNRIS/ NRCS	NRCS	Bexar County	Soil	1:24,000	Vector	County	1 m
L_48	RRC	RRC	Bexar County	Pipeline and Well			County	
L_49	USGS	USGS	Upper San Antonio Watersed	NHD	1:100,000	Vector	Subbasin 12100301	
Rancho De Las Cabras								
L_50	TNRIS	USGS	Dewees NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_51	TNRIS	USGS	Dewees NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_52	TNRIS	USGS	Dewees SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_53	TNRIS	USGS	Dewees SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	1 m
L_54	TNRIS	USGS	Dewees NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_55	TNRIS	USGS	Dewees NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_56	TNRIS	USGS	Dewees SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_57	TNRIS	USGS	Dewees SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	2.5 m
L_58	TNRIS	USGS	Dewees NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_59	TNRIS	USGS	Dewees NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_60	TNRIS	USGS	Dewees SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m

Local: by Quarter-Quad, Quad, County or Watershed

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Area	Resolution
L_61	TNRIS	USGS	Dewees SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	10 m
L_62	TNRIS	USGS	Dewees NW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_63	TNRIS	USGS	Dewees NE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_64	TNRIS	USGS	Dewees SW	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_65	TNRIS	USGS	Dewees SE	DOQQ	1:12,000	Raster	3.75 x 3.75 minute	30 m
L_66	TNRIS	USGS	Dewees	DRG	1:24,000	Vector	7.5 x 7.5 minute	
L_67	TNRIS	USGS	Dewees	DRG	1:100,000	Vector	7.5 x 7.5 minute	
L_68	TNRIS	USGS	Dewees	DRG	1:250,000	Vector	7.5 x 7.5 minute	
L_69	TNRIS	USGS	Dewees	Hypsography	1:24,000	Vector	7.5 x 7.5 minute	
L_70	TNRIS	USGS	Dewees	DEM	1:24,000	Raster	7.5 x 7.5 minute	30 m
L_71	TNRIS	TWDB	San Antonio Degree Block (30N 29S 99W 98E)	Hillshade		Vector	1 x 1 degree block	
L_72	TNRIS		San Antonio Degree Block (30N 29S 99W 98E)	NED			1 x 1 degree block	
L_73	TNRIS		Wlson County	DOQ Mosaic	1:12,000	Raster	County	1 m
L_74	TNRIS	TxDOT	Wlson County	Transportation Urban		Vector	County	
L_75	TNRIS/ NRCS	NRCS	Wilson County	Soil	1:24,000	Vector	County	1 m
L_76	RRC	RRC	Wilson County	Pipeline and Well			County	
L_77	USGS	USGS	Lower San Antonio Watersed	NHD	1:100,000	Vector	Subbasin 12100303	

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure
S_1	BEG	BEG	State	Oil and Gas Reservoirs		Vector
S_2	FEMA	FEMA	State	Q3 Flood Data		
S_3	NRCS		State	Precipitation		
S_4	TCEQ		State	Designated Stream Segments		Vector
S_5	TCEQ		State	Stream Segment Boundaries		Vector
S_6	TGLO	USACE/TGLO	State	Anchorage Areas		Vector
S_7	TGLO	TGLO	State	Aquaculture Facilities	1:24,000	Vector
S_8	TGLO	TGLO	State	Audubon Sanctuaries		Vector
S_9	TGLO	NOAA/TGLA	State	Bathymetry		Vector
S_10	TGLO	NOAA/TGLA	State	Bathymetry (6-food depth)		Vector
S_11	TGLO	TGLO	State	Beach Access	1:24,0000	Vector
S_12	TGLO	TPWD	State	Boat Ramps	1:24,0000	Vector
S_13	TGLO	TGLO	State	Cabins	1:24,000	Vector
S_14	TGLO	TxDOT	State	City and County Parks	1:24,000	Vector
S_15	TGLO	TxDOT	State	City Limits		Vector
S_16	TGLO	TGLO	State	Coastal Leases	1:24,000	Vector
S_17	TGLO	TGLO/TPWD	State	Colonial Waterbird Rookery Areas	1:24,000	Vector
S_18	TGLO	TNRCC	State	County Boundaries	1:24,000	Vector
S_19	TGLO		State	Dispersant Use Pre-Approval Zone		Vector
S_20	TGLO	USGS, TGLO	State	Elevation	1:250,000	Vector
S_21	TGLO	TGLO/BEG	State	Environmental Sensitivity Index Shoreline		Vector
S_22	TGLO	USACE/TGLO	State	Gulf Intracoastal Waterway/Ship Channels	1:24,000	Vector
S_23	TGLO	TxDOT/TGLO	State	Heliports	1:24,000	Vector
S_24	TGLO		State	Hydrography (coastal)	1:24,000	Vector
S_25	TGLO	TxDOT/TGLO	State	Hydrography (detailed)	1:24,000	Vector
S_26	TGLO	USGS	State	Hydrography (general)	1:2,000,000	Vector
S_27	TGLO	TxDOT	State	Hydrography (general)	1:24,000	Vector
S_28	TGLO	TGLO	State	National Wildlife Refuges	1:24,000	Vector
S_29	TGLO	TPWD	State	Natural Regions (major)		Vector
S_30	TGLO	TPWD	State	Natural Regions (sub)		Vector
S_31	TGLO		State	Oil and Gas Pipelines		Vector
S_32	TGLO	USGS/TGLO	State	Place Names	1:24,000	Vector

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure
S_33	TGLO	TGLO	State	Place Names	1:750,000	Vector
S_34	TGLO	TGLO	State	Place Names (populated)		Vector
S_35	TGLO	TxDOT	State	Railroads	1:24,000	Vector
S_36	TGLO	TWDB	State	Rainfall		
S_37	TGLO	USDOT	State	Roads/Highways	1:24,000	Vector
S_38	TGLO	NOAA/NOS/NGS	State	Shoreline	variable (sou	Vector
S_39	TGLO	TPWD	State	State Parks/Wildlife Management Areas	1:24;000	Vector
S_40	TGLO	TGLO	State	Submerged Lands		Vector
S_41	TGLO	USGS/TGLO	State	Topography	1:250,000	Raster
S_42	TGLO	TGLO	State	Urban Areas	1:24,000	Vector
S_43	TGLO	TPWD	State	Vegetation Areas		Vector
S_44	TGLO (NRI)	TNRCC	State	Air Monitoring Stations	1:24,000/1:1(	Vector
S_45	TGLO (NRI)	RRC	State	Tidal Disposal Facilities		Vector
S_46	TGLO (NRI)	TNRCC	State estuaries a	Water and Sediment Quality Sample Locations		Vector
S_47	TNRCC	TCEQ	State	Surface Water Rights Diversion Points		Vector
S_48	TNRIS	USGS	State	Active Mines and Mineral Plants		
S_49	TNRIS	TCEQ	State	Air Monitoring Sites		Vector
S_50	TNRIS	TCEQ	State	Air Quality Nonattainment and Near Nonattainment Areas		Vector
S_51	TNRIS		State	Airports		Vector
S_52	TNRIS		State	Cities		
S_53	TNRIS		State	County Boundaries	1:250,000	
S_54	TNRIS		State	County Boundaries (with 15 League Limit)		
S_55	TNRIS		State	County Boundaries (with coastline)	1:24,000	
S_56	TNRIS		State	County Boundaries (with generalized coastline)	1:24,000	
S_57	TNRIS		State	Highways		Vector
S_58	TNRIS	TCEQ	State	Industrial and Hazardous Waste Sites		Vector
S_59	TNRIS		State	Land Use/Land Cover		Vector
S_60	TNRIS	TCEQ	State	Landfills		Vector
S_61	TNRIS	USGS	State	Mineral Availability System		
S_62	TNRIS	USGS	State	Mineral Resource Data		
S_63	TNRIS		State	National Parks		
S_64	TNRIS	TPWD	State	Natural Regions (major)		Vector

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure
S_65	TNRIS	TPWD	State	Natural Regions (sub)		Vector
S_66	TNRIS		State	Precipitation		
S_67	TNRIS	TCEQ	State	Public Water Supply Sources		Vector
S_68	TNRIS		State	Quads (1 degree blocks)		Vector
S_69	TNRIS		State	Quads (1:100,000)		Vector
S_70	TNRIS		State	Quads (1:12,000; 3.75 minute)		Vector
S_71	TNRIS		State	Quads (1:24,000; 7.5 minute)		Vector
S_72	TNRIS	TCEQ	State	Radioactive Waste Sites		Vector
S_73	TNRIS		State	Railroads		Vector
S_74	TNRIS		State	Reservoirs		Vector
S_75	TNRIS	TLC	State	School District Boundaries		
S_76	TNRIS		State	State Parks		
S_77	TNRIS		State	STATSGO (soils)		
S_78	TNRIS		State	Streams		Vector
S_79	TNRIS	TCEQ	State	Superfund Sites		Vector
S_80	TNRIS	TCEQ	State	TCEQ Regions		
S_81	TNRIS	TLC	State	Texas House Districts		
S_82	TNRIS		State	Urban Areas		
S_83	TNRIS	TPWD	State	Vegetation Types		Vector
S_84	TNRIS		State	zip codes		
S_85	TWDB		State	Basins		Raster
S_86	TWDB		State	Economically Distressed Areas		
S_87	TWDB	TWDB	State	Existing Conveyances		Vector
S_88	TWDB	BEG	State	Existing Reservoirs		Vector
S_89	TWDB	not available	State	Groundwater Conservation Districts		Vector
S_90	TWDB	not available	State	Groundwater Management Areas (GMA)		Vector
S_91	TWDB	TWDB	State	Hillshade		Raster
S_92	TWDB	USGS	State	Hydrolic Unit Code (HUC)	1:500,000	Vector
S_93	TWDB	TWDB	State	Major Aquifers	1:250,000	Vector
S_94	TWDB	USGS	State	Major Rivers	1:2,000,000	Vector
S_95	TWDB	TWDB	State	Minor Aquifers	1:250,000	Vector
S_96	TWDB	not available	State	OPFCA Regions and Field Office		Vector

Texas State-Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure
S_97	TWDB	TWDB	State	Priority Groundwater Management Areas (PGMA)		Vector
S_98	TWDB	TWDB	State	Proposed Conveyances		Vector
S_99	TWDB	BEG	State	Recommended Reservoirs		Vector
S_100	TWDB	TWDB	State	Regional Water Planning Areas		Vector
S_101	TWDB	not available	State	River Authorities and Special Law Districts	1:100,000/1:50	Vector
S_102	TWDB	USGS	State	River Basins	1:500,000	Vector
S_103	TWDB	not available	State	StratMap County Boundaries with Coastline	1:24,000	Vector
S_104	TWDB	not available	State	StratMap County Boundaries without Coastline	1:24,000	Vector
S_105	TWDB	not available	State	StratMap Municipality Boundaries	1:24,000	Vector
S_106	TWDB	not available	State	StratMap Texas State Boundary with Coastline	1:24,000	Vector
S_107	TWDB	not available	State	StratMap Texas State Boundary without Coastline	1:24,000	Vector
S_108	TWDB	TWDB	State	Submitted Drillers Report Database		Vector
S_109	TWDB	TWDB	State	Terrain		Raster
S_110	TWDB	Texas Legislative Co	State	Texas House Districts (2002)		Vector
S_111	TWDB	Chris Daly/George Taylor	State	Texas Precipitation		Vector
S_112	TWDB	Texas Legislative Co	State	Texas Senate Districts (2002)		Vector
S_113	TWDB	TWDB	State	TWDB Groundwater Databse Welldata		Vector
S_114	TWDB	TWDB	State	Well Location Grid		
S_115	USEPA	USGS	State-Southeast	Multi-Resolution Land Characteristics Consortium (National Land		Raster
S_116	USFS	USFS	State-Southeast	LAA - Forest Area Connectivity		Raster
S_117	USFS	USFS	State-Southeast	LAA - Forest Area Density		Raster
S_118	USFS	USFS	State-Southeast	LAA - Forest Fragmentation Index		Raster
S_119	USFS	USFS	State-Southeast	LAA - Human Use Index		Raster
S_120	USFS	USFS	State-Southeast	LAA - Land Cover Contagion		Raster
S_121	USFS	USFS	State-Southeast	LAA - Land Cover Diversity		Raster
S_122	USFS	USFS	State-Southeast	LAA - Landscape Pattern Type Index A		Raster
S_123	USGS	USGS	State	GAP Analysis Project		

Nation Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
	http://mrdata.usgs.gov/sddpftp.html						
N_1	USGS	USGS	Nation Wide	Igneous rocks PLUTO		Vector	
N_2	USGS	USGS	Nation Wide	NURE Sediment Chemistry		Raster	
N_3	USGS	USGS	Nation Wide	Soil Chemistry		Vector	
N_4	USGS	USGS	Nation Wide	Soils PLUTO		Vector	
N_5	USGS	USGS	Nation Wide	Soils RASS		Vector	
N_6	USGS	USGS	Nation Wide	Unconsolidated Sediments PLUTO		Vector	
N_7	USGS	USGS	Nation Wide	Unconsolidated Sediments RASS		Vector	
N_8	USGS	USGS	Nation Wide	US Geology	1:2,500,000	Raster	1000 m
N_9	USGS	USGS	Nation Wide	US Geology [Geologic Faults]	1:2,500,000	Raster	1000 m
N_10	USGS	USGS	Nation Wide	US Aeromagnetics		Raster	1000 m
N_11	USGS	USGS	Nation Wide	US Bouguer Gravity Field		Raster	4 km
N_12	USGS	USGS	Nation Wide	US Isostatic Gravity Field		Raster	4 km
N_13	USGS	USGS	Nation Wide	US Magnetics NW Illumination		Raster	2 km
N_14	USGS	USGS	Nation Wide	Active Mines and Mineral Plants		Vector	
N_15	USGS	USGS	Nation Wide	Mineral Availability System		Vector	
N_16	USGS	USGS	Nation Wide	Mineral Resource Data		Vector	
N_17	TNRIS		Nation Wide	USA Boundary			
N_18	TGLO	NPS, WRD	Nation Wide	National Parks	1:24,000	Vector	
N_19	USGS	USGS	Nation Wide	Cities	1:2,000,000	Vector	
N_20	USGS	USGS	Nation Wide	Counties		Vector	
N_21	USGS	USGS	Nation Wide	Elevated Shaded Relief		Raster	2km
N_22	USGS	USGS	Nation Wide	Federal Lands	1:2,000,000	Vector	
N_23	USGS	USGS	Nation Wide	Hydrologic Units	1:250,000 and	Vector	
N_24	USGS	USGS	Nation Wide	Hydrology	1:2,000,000	Vector	
N_25	USGS	USGS	Nation Wide	Land Cover		Raster	1000 m
N_26	USGS	USGS	Nation Wide	Railroads	1:100,000	Vector	
N_27	USGS	USGS	Nation Wide	Roads	1:3,000,000	Vector	
N_28	USGS	USGS	Nation Wide	Urban Areas		Vector	
N_29	USGS	USGS	Nation Wide	USA	1:25,000,000	Vector	
N_30	USGS	USGS	Nation Wide	24000 Quadrangle Boundaries		Vector	
N_31	USGS	USGS	Nation Wide	250000 Quadrangle LU/LC	1:250,000	Vector	

Nation Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
	www.epa.gov/mrlc/data.html (links to spatial and non-spatial data, nationwide)						
N_32	USFS	USFS	13 state region (in	LAA - Assessment Projects by watershed		Vector	
N_33	USFS	USFS	13 state region (in	LAA - Assessment Projects by county		Vector	
N_34	USFS	USFS	13 state region (in	LAA - Assessment Projects by ecoregion		Vector	
N_35	USGS	USGS	Nationwide	Geology of the US			
N_36	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2002 Road			
N_37	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2002 Railroad			
N_38	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2002 hydrography			
N_39	NRCS/USDA	NRCS/USDA	Nationwide	Tiger 2000 water			
N_40	NRCS/USDA	NRCS/USDA	Nationwide	FEMAQ3 Flood Data	1:24,000		
N_41	NRCS/USDA	NRCS/USDA	Nationwide	8-digit hydrologic units	1:250,000		
N_42	NRCS/USDA	NRCS/USDA	Nationwide	DRG County Mosaic			
N_43	NRCS/USDA	NRCS/USDA	Nationwide	DRG	1:24,000		
N_44	NRCS/USDA	NRCS/USDA	Nationwide	DRG	1:100,000		
N_45	NRCS/USDA	NRCS/USDA	Nationwide	DRG	1:250,000		
N_46	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1:24,000 map index			
N_47	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1:100,000 map index			
N_48	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1:250,000 map index			
N_49	NRCS/USDA	NRCS/USDA	Nationwide	Quad 1 degree by state map index			
N_50	NRCS/USDA	NRCS/USDA	Nationwide	National Elevation Dataset			
N_51	NRCS/USDA	NRCS/USDA	Nationwide	DEM			
N_52	NRCS/USDA	NRCS/USDA	Nationwide	DOQ County Mosaic by APFO			
N_53	NRCS/USDA	NRCS/USDA	Nationwide	ErMapper Ortho Mosaic by NRCS			
N_54	NRCS/USDA	NRCS/USDA	Nationwide	National Land Cover Dataset by State			
N_55	NRCS/USDA	NRCS/USDA	Nationwide	Soil Survey Geographic (SSURGO) data base			
N_56	NRCS/USDA	NRCS/USDA	Nationwide	Annual Average Precipitation by state			
N_57	NRCS/USDA	NRCS/USDA	Nationwide	Monthly Average Precipitation by state			
	http://nationalatlas.gov/atlasftp.html						
N_58	NationalAtlas	USDA/NRCS	Nationwide	Average Annual Precipitation	1:2,000,000	vector	
N_59	NationalAtlas	USGS	Nationwide	Breeding Bird Survey Routes	1:2,000,000	vector	
N_60	NationalAtlas	USGS	Nationwide	County Boundaries	1:2,000,000	vector	

Nation Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
N_61	NationalAtlas	USACE	Nationwide	Dams	1:2,000,000	vector	
N_62	NationalAtlas	USFS	Nationwide	Ecoregions	1:2,000,000	vector	
N_63	NationalAtlas	USFS/USGS	Nationwide	Forest Cover Types	1:2,000,000	raster	
N_64	NationalAtlas	USGS	Nationwide	Forest Fragmentation Classification	1:2,000,000	raster	
N_65	NationalAtlas	USEPA/USGS	Nationwide	Forest Fragmentation Causes	1:2,000,000	raster	1 km
N_66	NationalAtlas	USEPA	Nationwide	Forest Fragmentation Causes	1:2,000,000	raster	540 m
N_67	NationalAtlas	USEPA	Nationwide	Forest Fragmentation Causes	1:2,000,000	raster	270 m
N_68	NationalAtlas	USGS	Nationwide	Generalized Geologic Map	1:2,000,000	vector	
N_69	NationalAtlas	USGS	Nationwide	Hydrologic Unit Boundaries	1:2,000,000	vector	
N_70	NationalAtlas	USGS	Nationwide	Invasive Species_Zebra Mussels	1:2,000,000	vector	
N_71	NationalAtlas	USGS	Nationwide	Land Cover Characteristics	1:2,000,000	raster	
N_72	NationalAtlas	USGS	Nationwide	Land Cover Diversity	1:2,000,000	raster	
N_73	NationalAtlas	USGS	Nationwide	Mineral Operations_Agriculture	1:2,000,000	vector	
N_74	NationalAtlas	USGS	Nationwide	Mineral Operations_Construction	1:2,000,000	vector	
N_75	NationalAtlas	USGS	Nationwide	Mineral Operations_Ferrous Metal Mines	1:2,000,000	vector	
N_76	NationalAtlas	USGS	Nationwide	Mineral Operations_Ferrous Metals Proces	1:2,000,000	vector	
N_77	NationalAtlas	USGS	Nationwide	Mineral Operations_Miscellaneous Industri	1:2,000,000	vector	
N_78	NationalAtlas	USGS	Nationwide	Mineral Operations_Nonferrous Metal Mine	1:2,000,000	vector	
N_79	NationalAtlas	USGS	Nationwide	Mineral Operations_Nonferrous Metal Proc	1:2,000,000	vector	
N_80	NationalAtlas	USGS	Nationwide	Mineral Operations_Refractory, Abrasive, a	1:2,000,000	vector	
N_81	NationalAtlas	USGS	Nationwide	Mineral Operations_Sand and Gravel	1:2,000,000	vector	
N_82	NationalAtlas	USGS	Nationwide	Mineral Operations_Stone, Crushed	1:2,000,000	vector	
N_83	NationalAtlas	USGS	Nationwide	NAWQA Surface-Water Sampling Sites	1:2,000,000	vector	
N_84	NationalAtlas	USGS	Nationwide	North American Bat Ranges	1:2,000,000	vector	
N_85	NationalAtlas	USGS	Nationwide	Parkways and Scenic Rivers	1:2,000,000	vector	
N_86	NationalAtlas	USGS	Nationwide	Principal Aquifers	1:2,000,000	vector	
N_87	NationalAtlas	USGS	Nationwide	Public Land Survey	1:2,000,000	vector	
N_88	NationalAtlas	USGS	Nationwide	Railroads	1:2,000,000	vector	
N_89	NationalAtlas	USGS	Nationwide	Realtime Streamflow Stations	1:2,000,000	vector	
N_90	NationalAtlas	USGS	Nationwide	Roads	1:2,000,000	vector	
N_91	NationalAtlas	USGS	Nationwide	Shaded Relief of North America	1:2,000,000	raster	
N_92	NationalAtlas	USGS	Nationwide	States	1:2,000,000	vector	
N_93	NationalAtlas	USGS	Nationwide	Streams and Waterbodies	1:2,000,000	vector	

Nation Wide

ID	Available From	Originator/ Publisher	Location	Data	Scale	Structure	Resolution
N_94	NationalAtlas	USGS	Nationwide	Wilderness Areas	1:2,000,000	vector	
N_95	NationalAtlas	USGS	Nationwide	Amphibian Distributions			
N_96	NationalAtlas	USGS	Nationwide	Butterflies			
N_97	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Chinese Privet			
N_98	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Tallowtree			
N_99	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Common Gorse			
N_100	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Leafy Spurge			
N_101	NationalAtlas	USDA/NRCS	Nationwide	Invasive Species_Purple Loosestrife			
N_102	NationalAtlas	USGS	Nationwide	Moths			
N_103	NationalAtlas	CDC	Nationwide	West Niles Virus_Human Cases			
N_104	NationalAtlas	CDC	Nationwide	West Niles Virus_Mosquito Surveillance			
N_105	NationalAtlas	CDC	Nationwide	West Niles Virus_Sentinel Flock Surveillance			
N_106	NationalAtlas	CDC	Nationwide	West Niles Virus_Veterinary Cases			
N_107	NationalAtlas	CDC	Nationwide	West Niles Virus_Wild Bird Cases			
N_108	NationalAtlas	CDC	Nationwide	West Niles Virus_Human Cases			
N_109	NationalAtlas	CDC	Nationwide	West Niles Virus_Mosquito Surveillance			
N_110	NationalAtlas	CDC	Nationwide	West Niles Virus_Sentinel Flock Surveillance			
N_111	NationalAtlas	CDC	Nationwide	West Niles Virus_Veterinary Cases			
N_112	NationalAtlas	CDC	Nationwide	West Niles Virus_Wild Bird Cases			
N_113	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Frequency Data			
N_114	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Botulism			
N_115	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Cholera			
N_116	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_Lead Poisoning			
N_117	NationalAtlas	USGS NWHC	Nationwide	Wildlife Mortality_OP/CARB Poisoning			

NonGIS Digital Maps

ID	Available From	Location	Data	File Format
M_1	EAA	EAA Region	EAA Regions	.jpg
M_2	EAA	Bexar County	Bexar County Recharge	.jpg
M_3	EAA	EAA Region	Interactive Map	interactive

NonGIS Static Maps

Book

San Antonio Missions National Historical Park
Rancho De Las Cabras Cultural Landscape Inventory
Contract No. 1443RP760097002
Prepared for: USDI, NPS, San Antonio Missions National Historical Park, Intermountain Region
Prepared by: OCULUS
Novemeber 1998

Map	Year	Scale
Location and Context Maps: Rancho de las Cabras Cultural Landscape Inventory	1989	1:250,000
Study Boundary: Rancho de las Cabras Cultural Landscape Inventory	1961	1:24,000
Rancho de las Cabras Existing Conditions: Spatial Organization	Nov-98	1:68,010
Rancho de las Cabras Existing Conditions: Surface Water and Hydrology	Nov-98	1:68,010
Rancho de las Cabras Existing Conditions: Structures/Major Topgraphic Modifications	Nov-98	1:68,010
Rancho de las Cabras Existing Conditions: Single-Lane Vehicle Tracks	Nov-98	1:68,010
Rancho de las Cabras Existing Conditions: Vegetation Types	Nov-98	1:68,010
Rancho de las Cabras Existing Conditions: Small-Scale Features	Nov-98	1:68,010
Rancho de las Cabras Existing Conditions: Views and Viewpoints	Nov-98	1:68,010
Rancho de las Cabras Landscape Character Areas	Nov-98	1:68,010
Racho de las Cabras Contributing Resources	Nov-98	1:68,010

Databases

		Query info down to…				
ID	**Database**	**park**	**county**	**state**	**other**	**Who**
D_1	Air Quality	no	no	no	sampling station	TCEQ
D_2	Amphibian Counts Database	?	?	?	?	USGS
D_3	ARMI	no	no	no	no	USGS
D_4	Breeding Bird Census	?	?	?	?	USGS
D_5	Breeding Bird Survey	no	no	yes	route	USGS
D_6	Butterflies of North America	no	yes	yes		USGS
D_7	Chinese Privet	no	yes	yes		NRCS/USDA
D_8	Christmas Bird Count	?	no	yes	count	Audubon
D_9	Christmas Bird Count	no	no	no	count	USGS
D_10	eBird	no	yes	yes	any location	
D_11	Edwards Aquifer Data	no	no	no	Stream	
D_12	Envirofacts_Air Realeases (AIRS/AFS)		yes	yes	EPA region	EPA
D_13	Envirofacts_Environmental Radiation Ambient Monitoring System (ERAMS)		yes	yes	EPA region	EPA
D_14	Envirofacts_Multisystem Query		yes	yes	EPA region	EPA
D_15	Envirofacts_National Contaminant Occurrence Database (NCOD)		yes	yes	EPA region	EPA
D_16	Envirofacts_Toxic Release Inventory (TRI)		yes	yes	EPA region	EPA
D_17	Envirofacts_UV index		yes	yes	EPA region	EPA
D_18	Envirofacts_Water Discharge Permits (PCS)		yes	yes	EPA region	EPA
D_19	Inventory and Monitoring on National Parks	yes				NPS
D_20	MAPS	no	no	yes	region, station	USGS
D_21	MidWinter Bald Eagle Count	no	no	yes	route	
D_22	Mid-Winter Waterfowl Survey	no	no	yes	flyway, species, year	USFWS
D_23	Migratory Bird Data Center					USFWS/USGS
D_24	NARCAM	no	yes	no		USGS
D_25	National Atlas of the US					
D_26	NatureServe Explorer	no	no	yes	plant/animal, status	NatureServe

Databases

		Query info down to…				
ID	**Database**	**park**	**county**	**state**	**other**	**Who**
D_27	NBII			yes	lat/long coordinates	USGS
D_28	NBII Bird Conservation node					USGS
D_29	Nonindigenous Aquatic Species (NAS)	no	no	yes	HUC (2 and 6)	USGS
D_30	NWIS Web Site	no	yes	yes	HUC, Sampling Site	USGS
D_31	NWQA Data Warehouse	no	no	no	study unit basin	USGS
D_32	PLANTS Database	no	no	yes		NRCS/USDA
D_33	Project Feeder Watch	no	no	yes		Cornell Lab of Ornithology
D_34	Toxic Release Inventory Program (TRI)					TNRCC
D_35	Water Quality	yes	no	no		NPS
D_36	Water Quality	no	no	no	sampling station	TCEQ
D_37	Water Quality Monitoring	no	no	no	sampling site	SARA
D_38	Waterbird Monitoring Patnership	no	no	no	site_ID	USGS
D_39	Waterfowl Breeding Population and Habitat Survey	no	no	?	species, year, strata	USFWS

NatureBib Maps

NBIB_KEY_ID	Author	Year	Title
537335	<No Author>	1980	Aerial radiometric and magnetic survey, national topographic map, San Antonio, Texas; final report
48400	<No Author>	1978	Flood hazard boundary map, Bexar County, Texas unincorporated area
48401	<No Author>	1984	Flood hazard boundary map, Bexar County, Texas unincorporated area
48455	<No Author>	1983	Flood insurance rate map, City of San Antonio, Texas, Bexar County
537362	E., , Butz, T. R., , Minkin, S. C., , Kane, V. E., ,	1978	Hydrogeochemical and stream sediment reconnaissance basic data for San Antonio NTMS Quadrangle, Texas
537361	, Bard, C. S., , Helgerson, R. N., and Grimes, J. G.,	1980	Hydrogeochemical and stream sediment detailed geochemical survey for Texas Gulf Coast
109500	Cartographer Unknown,		San Antonio Missions National Historical Park Proposed Expansion and Land Status, Bexar County, Texas
537403	Dickinson, K. A.,		Stratigraphy and depositional environments of uranium host rocks in western Karnes County, Texas Miscellaneous Field Studies Map
537386	Trumbull, James Van Alen, and Moxham, Robert	1961	Preliminary aeroradioactivity and geologic map of the Floresville SE Quadrangle, Karnes and Wilson counties, Texas Geophysical Investigations Map
537391	Greimel, Thomas C, and Ambrose, Mary L.,	1982	San Antonio Quadrangle, Texas
505921	Kingston, Jim,	1987	Long-term effects of in situ uranium leach mining restoration in the Oakville aquifer system near George West, Texas
537387	Land, Larry F.,	1984	Proposed 10-year plan for continuation of hydrologic studies of the Edwards Aquifer, San Antonio area, Texas U.S. Geological Survey Open-file report
537339	Maclay, R. W, and Small, Ted A.,	1984	Carbonate geology and hydrology of the Edwards Aquifer in the San Antonio area, Texas U.S. Geological Survey Open-file report
18699	National Park Service,	1981	Boundary Map, San Antonio Missions National Historical Park of San Antonio, Texas
109532	Oliver, John B. and Et Al.,	1992	San Juan Acequia System and Miscellaneous Mission San Juan Capistrano Acequia System

NatureBib Maps

NBIB_KEY_ID	Author	Year	Title
109531	Oliver, John B. and Et Al.,	1992	San Juan Acequia Maps and Drawings Mission San Juan Capistrano Acequia
5964	Photographer Unknown,		Aerial photos of flood plain at San Antonio Missions
34641	Rhombus, P. A. and Et Al.,	1991	Drainage and Regrading of San Juan Mission Courtyard and Surrounding Areas Mission San Juan Drainage and Acequia
505906	Stephenson, Lloyd William,	1918	The camps around San Antonio, Texas, San Antonio Quadrangle, Kelly Fields and Camp Travis Special Topographic Maps
52947	Bureau Of Economic Geology,	1974	Geologic atlas of Texas, San Antonio sheet

Abbreviations	Description	Web Site
BEG	Bureau of Economic Geology (University of Texas, Austin)	http://www.beg.utexas.edu/
CCC	Texas Coastal Coordination Council	
CIR	Color Infra-Red	
CKWRI	Caesar Kleberg Wildlife Research Institute (Texas A&M)	
CMI	Conservation Management Unit (Virginia Tech)	
DEM	Digital Elevation Model	
DLG	Digital Line Graph	
DOQQ	Digital Ortho Quarter Quadrangle	
DRG	Digital Raster Graphics	
EAA	Edwards Aquifer Authority	http://www.edwardsaquifer.org/Pages/frames_aquifer.html
ELLIS	Energy Land and Lease Inventory System	
EMAP	Environmental Monitoring and Assessment Program	
FEMA	Federal Emergency and Management Agency	http://www.gismaps.fema.gov/rs.shtm
GBIS	Galveston Bay Information System	
GERG	Texas A&M University Geochemical and Environmental Research Group	
LAA	Landscape Analysis and Assessment	
LOSCO	Louisiana Oil Spill Coordinator's Office	
NED	National Elevation Dataset	
NGS	National Geodetic Survey	
NHD	National Hydrography Dataset	
NOAA	National Oceanic and Atmospheric Administration	
NOS	National Ocean Service	
NPS	National Park Service	
NPSC	Northern Prairie Science Center	
NRCS	Natural Resource Conservation Service	http://www.nrcs.usda.gov/technical/maps.html
NRI	Natural Rescource Inventory	
NWRC	National Wetlands Research Center	
PWRC	Patuxent Wildlife Research Center	
RRC	Railroad Commission of Texas	http://www.rrc.state.tx.us/other-information/automated/itssmap.html
SARA	San Antonio River Authority	
TCEQ	Texas Commission on Environmental Quality	http://www.tceq.state.tx.us/
TCMS	Texas Centric Mapping System	
TCNRI	Texas Coastal Natural Resource Inventory	http://www.nri.state.tx.us/nri/
TGLO	Texas General Land Office	http://www.glo.state.tx.us/gisdata/gisdata.html

Abbreviations	Description	Web Site
TLC	Texas Legislative Council	
TNRCC	Texas Natural Resource Conservation Commission	
TNRIS	Texas Natural Resource Information System	http://www.tnris.state.tx.us/
TPWD	Texas Parks and Wildlife Department	
TSMS	Texas State Mapping System (State Plane Coordinate	
TWC	Texas Water Commission	
TWDB	Texas Water Development Board	http://www.twdb.state.tx.us/home/index.asp
TWRI	Texas Water Resources Institute	
TxDOT	Texas Department of Transportation	
USEPA	United States Environmental Protection Agency	http://www.epa.gov/mrlc/data.html
USFS	US Forest Service	http://www.srs.fs.usda.gov/4803/landscapes/index.html
USFW	United States Fish and Wildlife Service	
USGS	United States Geological Survey	http://mapping.usgs.gov/products.html#digital_data
USMMS	U.S. Minerals Management Service	
UTCRWR	UT Center for Research in Water Resources	
WRD	Water Resources Division	
NationalAtlas	National Atlas	http://nationalatlas.gov/atlasftp.html